

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: GAECHTER, Jean-Pierre
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TITLE: MECHANICAL ACTUATOR INCLUDING A HELICAL-
CAM NUT

APPEAL BRIEF

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REAL PARTY IN INTEREST

The Appellant and Inventor, Mr. Jean-Pierre GAECHTER, is the real party in interest.

RELATED CASES

None.

JURISDICTIONAL STATEMENT

Jurisdiction over the proceeding is with the Examiner and passes to the Board upon transmittal of the file, including all briefs and examiner's answers, to the Board.

STATUS OF CLAIMS

Claims 1-52 are canceled.

Claims 53-66 stand rejected and are the claims at issue in the present appeal.

STATUS OF AMENDMENTS

All pending claims 53-66 were finally rejected on 18 May 2009.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates to linear actuators and, in particular, to mechanical actuators driven by an electric motor, i.e. electro-mechanical actuators.

Claim 53, the only pending independent claim, claims an actuator (see Para. [0043], Fig. 1). The actuator comprises an outer tubular body (Paras. [0043] - [0044], ref no. 20 in Figs.), an inner tubular body (Pars. [0043]-[0044], ref. no. 10 in all Figs.) having a portion positioned inside the outer tubular body, a nut assembly (ref. no. 70 in Fig. 1) interconnected to the inner tubular body, a plurality of balls (Paras. [0047] - [0052], ref. No. 22 in all Figs.), and a driving means (ref. no. 2 in all Figs.).

The nut assembly has at least one helical ball race (Paras. [0047]-[0048]). The helical ball race has a helical portion extending circumferentially for less than 360° around the nut assembly. The helical ball race has a widened portion (ref no. 45 and 55 in Fig. 5) connecting to a first end and to a second end of the helical portion. The nut assembly comprises a plurality of aligned elements (Para. [0047] as “cams”, ref nos. 40, 50, and 60 in Figs. 1-6 and 12) where each of the plurality of aligned elements has a generally cylindrical shape with at least one bevel (Para. [0047], ref. Nos. 41, 51, 52, 62 in Figs. 1, 5, and 6) forming a helical cam surface. The helical cam surfaces of adjacent aligned elements of the plurality of aligned elements define the helical ball race.

Each of the plurality of balls is received between the helical ball race and an inner surface (ref. no. 21 in Fig. 1) of the outer tubular body. The widened portion (ref. no. 45 and 55 in Fig. 5) of the helical ball race defines a re-circulation zone for

the plurality of balls.

The driving means is cooperative with the nut assembly. The driving means rotates the nut assembly so as to translate the outer tubular body relative to the inner tubular body. The inner surface of the outer tubular body has a grooved helical ball race formed on an inner surface thereof so as to be suitable for guiding the plurality of balls. The driving means comprises a motor mounted in a fixed position inside the inner tubular body.

The inner surface of the outer tubular body has a helical pitch substantially equal to a helical pitch of the helical ball race of the nut assembly.

The at least one helical ball race comprises a plurality of ball races. The recirculation zones of the plurality of ball races are not aligned with a direction of the displacement of the outer tubular body.

The plurality of ball races are evenly angularly disposed about the direction of displacement. Each of the helical cam surfaces defines a setback. A pair of the plurality of aligned elements being positioned with respect to each other such that the setbacks thereof face each other and so that the setbacks define the recirculation zone.

The plurality of aligned elements are tightenable with respect to each other.

The actuator assembly further comprises a nut member (ref. no. 4 in Fig. 1) cooperative with the plurality of aligned elements so as to adjust the tightening of the plurality of aligned elements. The actuator assembly further comprises a spring (ref. no. 5 in Fig. 1) interposed between the nut member and the plurality of aligned elements.

Each of the plurality of aligned elements has a cross-section with a beveled circular edge. The helical cam surface is inclined relative to an axis of the cylindrical shape. The helical cam surface has ends connected to a setback surface of a generally conical shape.

The recirculation zone is defined by the setback of a pair of the plurality of aligned elements. The helical ball faces of the inner surface of the outer tubular body are formed by plastic distortion by the plurality of balls.

The helical surface of the outer tubular body comprises an interior tube (ref. no. 93 in Fig. 10) molded within the outer tubular body. The interior tube has the helical ball race formed therein.

The actuator assembly further comprises another tubular body cooperative with the outer tubular body. The outer tubular body connects to another nut assembly such that a rotation of the another nut assembly causes a displacement of the another tubular body with respect to the outer tubular body.

The outer tubular body is formed of a material selected from the group consisting of aluminum, carbon fibers and molded polymers.

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

In the Final Office Action of 18 May 2009, it was indicated that claims 53-59 and 61-63 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 2,756,609 to Hogan (referred to hereinafter as ‘Hogan’) in view of U.S. Patent No. 4,138,902 to Brusasco (referred to hereinafter as ‘Brusasco’), and further in view of U.S. Patent No. 2,299,785 to Barrett (referred to hereinafter as ‘Barrett’).

Claim 60 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hogan in view of Brusasco and Barrett.

Claim 64 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hogan in view of Brusasco and Barrett, and further in view of U.S. Patent Publication Serial No. 2004/0093973 to Halasy-Wimmer (referred to hereinafter as ‘Halasy-Wimmer’).

Claim 65 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hogan in view of Brusasco and Barrett, and further in view of U.S. Patent No. 5,358,265 to Yapple (referred to hereinafter as ‘Yapple’).

Claim 66 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Hogan in view of Brusasco and Barrett, and further in view of U.S. Patent No. 6,101,889 to Laskey (referred to hereinafter as ‘Laskey’).

STATEMENT OF FACTS

The subject matter of the application in this case was originally disclosed in PCT Patent Application No. PCT/FR03/02607, filed on 29 August 2003, and entitled "MECHANICAL ACTUATOR INCLUDING A HELICAL-CAM NUT."

Claims 1-18 were filed in non-provisional U.S. Patent Application No. 10/524,298 on 28 July 2005, entitled "MECHANICAL ACTUATOR INCLUDING A HELICAL-CAM NUT," and this application is a national stage claiming priority to the international application.

After the first Office Action of 12 May 2008, Appellant amended the claims to place the application into a condition for allowance over the cited prior art. Claims 1-18 were canceled, and the subject matter was re-presented in claims 19-36.

A Final Action was mailed on 29 September 2008. The Final Action rejected claims 19-36 for reasons similar to the previous Office Action.

In response to the Final Action of 29 September 2008, Appellant filed a Request for Continued Examination and a second amendment on 31 December 2008, in which Claims 19-36 were canceled, and the subject matter was re-presented in claims 37-52.

A third Office Action was mailed on 27 January 2009. The third Office Action included rejections similar to the previous Office Action.

A third amendment was submitted on 12 April 2009. Claims 37-52 were canceled, and the subject matter was re-presented in claims 53-66 to traverse the rejection in the third Office Action.

A Final Action was mailed on 18 May 2009, rejecting Claims 52-66 for the same reasons of the previous Office Action.

In response, Appellant filed a Petition to Revive and a Notice of Appeal on 30 November 2009.

On 16 February 2010, the Petition to Revive was granted and the time for the filing of an Appeal Brief was reset from this date.

Applicant then withdrew the appeal by filing an amendment with a request for continued examination on January 28, 2009.

This Appeal Brief is due on 16 May 2010, with a one-month Extension of Time.

ARGUMENT

I. Overview

Applicant/Appellant respectfully disputes that any of the claims, as amended before the Final Office Action of May 18, 2009 (hereinafter referred to as ‘Office Action’), are obvious under 35 U.S.C. § 103(a). Applicant and Examiner are at an impasse, as the parties’ stance has not changed since this time.

Claim 53 is the independent claims at issue. Claims 54-66 depend from independent claim 53.

Applicant argues that that the structural limitations of claims 53-66 are patentable, and that the articulated reasoning given for the obviousness rejections lacks appropriate rational and does not support a prima facie case for obviousness. In the alternative, Applicant contends claims 53-66 are patentable because there is no T/S/M to modify the prior art references to arrive at the invention of claims 53-59, 61-63 and 64-66; the proposed modification in claim 53 renders Hogan unfit for its intended purpose; the principle operation of Hogan is changed; Hogan teaches away from grooved helical ball races on the inner surface of the outer tubular body; and claims 53-66 are patently distinguishable over prior art.

II. No Prima Facie Case of Obviousness Has Been Made For The Rejection of Claims 53-59, 61-63, 64, 65, and 66 Under 103(a)

A. Claims 53-59 and 61-63

Claims 53-59 and 61-63 should be allowed because the Examiner has not made a prima facie case of obviousness for claims 53-59 and 61-63. The contents of an

obviousness rejection under 35 U.S.C. 103(a) must include: (A) the relevant teachings of the prior art relied upon, (B) the difference or differences in the claim over the applied reference(s), (C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and (D) an explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made. MPEP § 706.02(j) (emphasis added). ““To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.”” *Id.* (quoting *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985)). “It is important for an examiner to properly communicate the basis for a rejection so that the issues can be identified early and the applicant can be given fair opportunity to reply.” *Id.* (emphasis added).

Claims 53-59 and 61-63 stand rejected under 35 USC 103(a) as unpatentable over Hogan in view of Brusasco and further in view of Barrett. Applicant contends the fourth requirement for an obviousness rejection (emphasized above), which requires the rejections of claims 53-59 and 61-63 have an “explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made,” has not been met. MPEP § 706.02(j). The explanation presented for rejecting these claims is stated in the Office Action:

It would have been obvious to one having ordinary skill in the art at the

time the invention was made to modify Hogan to provide the first tubular body with a helical ball race formed on an inner surface thereof so as to be suitable for guiding said plurality of balls and the race being substantially equal helical pitch of a ball race of the nut, as taught by Brusasco, for the purpose of assuring the pitch movement of the balls and moving body are correct.

Office Action, p. 5 (May 18, 2009) (emphasis added). Although Applicant's pertinent structural element is termed "outer tubular body" in claim 53, Applicant believes the term "first tubular body" was used to identify Applicant's "outer tubular body," and the rejection rationale contains "first tubular body" because it was cut-and-pasted from the 1st to the 2nd to the 3rd to the 4th Office Action. Thus, every office action issued to the Applicant has not had a prima facie case of obviousness for these claims.

The rejection for claims 53-59 and 61-63 further includes the explanation: It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Hogan in view of Brusasco and provide a motor that is fixed inside a second tubular body being drivable in translation with respect to the first tubular body, as taught by Brusasco, for the purpose of providing an actuator that has a low manufacturing cost, simply [sic] construction and an extremely low capacity coupling with ground with a high leakage resistance to ground [sic].

Office Action, p. 6 (May 18, 2009) (emphasis added). Although Applicant's pertinent structural element is termed "inner tubular body" in claim 53, Applicant believes the term "second tubular body" was used to identify Applicant's "inner tubular body," and the rejection contains "second tubular body" because it was cut-and-pasted from the 1st to the 2nd to the 3rd to the 4th Office Action. Thus, every office action issued to the Applicant has not had a prima facie case of obviousness for claims 53-59 and 61-63, issues have not been identified, Applicant has not been given a fair opportunity to reply, and claims 53-59 and 61-63 are allowable.

"The Federal Circuit has stated that... 'there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" MPEP § 2142 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). That is, the explanation required by MPEP § 706.02(j) must have some articulated reasoning with some rational underpinning. *See id.* Applicant contends the articulated reasoning provided in the Office Action does not have rational underpinning to support a legal conclusion of obviousness because the rational underpinning in the Office Action is for a function to be completed ("for the purpose of assuring the pitch movement of the balls and moving body are correct" and "for the purpose of providing an actuator that has a low manufacturing cost, simply construction and an extremely low capacity coupling with ground with a high leakage resistance to ground").

The articulated reason for the obviousness rejection of claims 53-59 and 61-63 in the Office Action is because it is obvious to modify; however, there is no rational

underpinning as required by law. *See id.* Section 2143 of the MPEP requires that a rejection based on an obvious modification show “some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art references ... to arrive at the claimed invention.” The rational underpinning of the rejection in the Office Action does not show a teaching, suggestion, or motivation; thus, the rational underpinning is inadequate and a prima facie case of obviousness has not been made for claims 53-59 and 61-63.

Without a prima facie case of obviousness, issues have not been identified early and Applicant has not been given a fair opportunity to address a proper rejection in any of the office actions because the office actions rejecting the subject matter of claims 53-59 and 61-63 have issued with rejections not having a proper explanation for a prima facie case of obviousness. *See* MPEP § 706.02(j) . Thus, claims 53-59 and 61-63 are allowable because no prima facie case of obviousness has been made.

B. Claim 64

Claim 64 stands rejected under 35 USC 103(a) as unpatentable over Hogan in view of Brusasco and Barrett and further in view of Halasy-Wimmer. Referring to the case law cited above in Section (I.)(A.), Applicant contends the fourth requirement for an obviousness rejection requires a rejection have an “explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made,” has not been met. MPEP § 706.02(j). The explanation presented for rejecting these claims is stated in the Office Action:

It would have been obvious to one having ordinary skill in the art at the

time the invention was made to modify Hogan in view of Brusasco and Barrett and provide an interior tube arranged in the outer tubular body, the interior tube comprising the ball-races, as taught by Halasy-Wimmer, for the purpose of providing a device with a considerable reduction in manufacturing costs due to non-cutting fabrication.

Office Action, p. 7 (May 18, 2009). The 2nd, 3rd, and 4th office actions contain this same explanation; thus, issues have not been identified, Applicant has not been given a fair opportunity to reply, and claim 64 is allowable. *See* MPEP § 706.02(j).

“The Federal Circuit has stated that... ‘there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’” MPEP § 2142 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). That is, the explanation required by MPEP § 706.02(j) must have some articulated reasoning with some rational underpinning. *See id.* Applicant contends the articulated reasoning provided in the Office Action does not have rational underpinning to support a legal conclusion of obviousness because the rational underpinning in the Office Action is for a function to be completed (“for the purpose of providing a device with a considerable reduction in manufacturing costs due to non-cutting fabrication”).

The articulated reason for the obviousness rejection of claim 64 in the Office Action is because it is obvious to modify; however, there is no rational underpinning as required by law. *See id.* Section 2143 of the MPEP requires that a rejection based on an obvious modification show “some teaching, suggestion, or motivation in the

prior art that would have led one of ordinary skill in the art to modify the prior art references ... to arrive at the claimed invention.” The rational underpinning of the rejection in the Office Action does not show a teaching, suggestion, or motivation; thus, the rational underpinning is inadequate, a proper explanation has not been presented, and a prima facie case of obviousness has not been made for claim 64.

Without a prima facie case of obviousness, issues have not been identified early and Applicant has not been given a fair opportunity to address a proper rejection in any of the office actions because all the office actions rejecting the subject matter of claim 64 have issued with rejections not having a proper explanation for a prima facie case of obviousness. *See* MPEP § 706.02(j). Thus, claim 64 is allowable because no prima facie case of obviousness has been made.

C. Claim 65

Claim 65 stands rejected under 35 USC 103(a) as unpatentable over Hogan in view of Brusasco and Barrett and further in view of Yapple. Referring to the case law cited above in Section (I.)(A.), Applicant contends the fourth requirement for an obviousness rejection requires a rejection have an “explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made,” has not been met. MPEP § 706.02(j). The explanation presented for rejecting these claims is stated in the Office Action:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Hogan in view of Brusasco and Barrett and provide another tubular body, the outer tubular body being

connected to another nut, rotation of the another nut causing the displacement in the translation of the another body with respect to the outer tubular body, as taught by Yapple, for the purpose of providing a device with a considerable reduction in manufacturing costs due to non-cutting fabrication.

Office Action, p. 8 (May 18, 2009). The 1st, 2nd, 3rd, and 4th office actions contain this same explanation; thus, issues have not been identified, Applicant has not been given a fair opportunity to reply, and claim 65 is allowable. *See* MPEP § 706.02(j).

“The Federal Circuit has stated that... ‘there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’” MPEP § 2142 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). That is, the explanation required by MPEP § 706.02(j) must have some articulated reasoning with some rational underpinning. *See id.* Applicant contends the articulated reasoning provided in the Office Action does not have rational underpinning to support a legal conclusion of obviousness because the rational underpinning in the Office Action is for a function to be completed (“for the purpose of providing a device with a considerable reduction in manufacturing costs due to non-cutting fabrication”).

The articulated reason for the obviousness rejection of claim 65 in the Office Action is because it is obvious to modify; however, there is no rational underpinning as required by law. *See id.* Section 2143 of the MPEP requires that a rejection based on an obvious modification show “some teaching, suggestion, or motivation in the

prior art that would have led one of ordinary skill in the art to modify the prior art references ... to arrive at the claimed invention.” The rational underpinning of the rejection in the Office Action does not show a teaching, suggestion, or motivation; thus, the rational underpinning is inadequate, a proper explanation has not been presented, and a prima facie case of obviousness has not been made for claim 65.

Without a prima facie case of obviousness, issues have not been identified early and Applicant has not been given a fair opportunity to address a proper rejection in any of the office actions because the office actions rejecting the subject matter of claim 65 have issued with rejections not having a proper explanation for a prima facie case of obviousness. *See* MPEP § 706.02(j). Thus, claim 65 is allowable because no prima facie case of obviousness has been made.

D. Claim 66

Claim 66 stands rejected under 35 USC 103(a) as unpatentable over Hogan in view of Brusasco and Barrett and further in view of Laskey. Referring to the case law cited above in Section (I.)(A.), Applicant contends the fourth requirement for an obviousness rejection requires a rejection have an “explanation as to why the claimed invention would have been obvious to one of ordinary skill in the art at the time the invention was made,” has not been met. MPEP § 706.02(j). The explanation presented for rejecting these claims is stated in the Office Action:

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Hogan in view of Brusasco and Barrett and provide for the outer tubular member being made out of

aluminum, as taught by Laskey, for the purpose of providing material suitable for the load being handled.

Office Action, p. 9 (May 18, 2009). The 1st, 2nd, 3rd, and 4th office actions contain this same reasoning; thus, issues have not been identified, Applicant has not been given a fair opportunity to reply, and claim 66 is allowable. *See* MPEP § 706.02(j).

“The Federal Circuit has stated that... ‘there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.’” MPEP § 2142 (quoting *In re Kahn*, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006)). That is, the explanation required by MPEP § 706.02(j) must have some articulated reasoning with some rational underpinning. *See id.* Applicant contends the articulated reasoning provided in the Office Action does not have rational underpinning to support a legal conclusion of obviousness because the rational underpinning in the Office Action is for a function to be completed (“for the purpose of providing material suitable for the load being handled”).

The articulated reason for the obviousness rejection of claim 66 in the Office Action is because it is obvious to modify; however, there is no rational underpinning as required by law. *See id.* Section 2143 of the MPEP requires that a rejection based on an obvious modification show “some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill in the art to modify the prior art references ... to arrive at the claimed invention.” The rational underpinning of the rejection in the Office Action does not show a teaching, suggestion, or motivation; thus, the rational underpinning is inadequate, a proper explanation has not been

presented, and a prima facie case of obviousness has not been made for claim 66.

Without a prima facie case of obviousness, issues have not been identified early and Applicant has not been given a fair opportunity to address a proper rejection in any of the office actions because all office actions rejecting the subject matter of claim 66 have issued with rejections not having a proper explanation for a prima facie case of obviousness. *See* MPEP § 706.02(j). Thus, claim 66 is allowable because no prima facie case of obviousness has been made.

III. No Prima Facie Case of Obviousness Has Been Made For The Rejection of Claim 60 Under 103(a)

Applicant contends claim 60 is allowable because the Examiner has not made a prima facie case of obviousness for claim 60. Referring to the case law cited in Section I above, Applicant contends the fourth requirement for an obviousness rejection requires the rejection of claim 60 have adequate explanation. The explanation presented for rejecting claim 60 is stated in the Office Action:

It would have been obvious to one having ordinary skill in the art to arrange the spring between the nut and the aligned elements since rearranging the location of the spring would have been obvious to try and would still yield predictable results of subjecting the balls to a radial thrust against the outer tube (c2/164-70). If the spring is located at the end of the nut assembly or between the nut and the aligned elements in Hogan the function of the spring does not change.

Office Action, p. 6-7 (May 18, 2009) (emphasis added). Incorporating the case law

cited above, the explanation has an articulated reasoning that the limitations of Claim 60 are obvious to try and yield predictable results; however, Applicant contends the explanation provided in the Office Action does not have rational underpinning to support a legal conclusion of obviousness because a finite number of predictable solutions have not been identified and predictable success has not been shown. Moreover, the explanation provided in the Office Action does not have a rational underpinning because the Office does not show, for example: prior art combined according to known methods, a simple substitution of one element for another, application of a known technique to a known device, or design incentives or market forces. MPEP 2143.

Without a rational underpinning of the reasoning in the explanation, a prima facie case of obviousness has not been made for claim 60. Without a prima facie case of obviousness, issues have not been identified early and Applicant has not been given a fair opportunity to address a proper rejection in the office actions because all office actions containing a rejection for the subject matter of claim 60 have issued with rejections not having an adequate explanation for a prima facie case of obviousness. *See* MPEP § 706.02(j). Thus, claim 60 is allowable because no prima facie case of obviousness has been made.

IV. In The Alternative, Claims 53-59, 61-63, 64, 65, and 66 Are Not Obvious

A. There Is No T/S/M To Modify The Prior Art References To Arrive At The Invention Of Claims 53-59, 61-63, 64-66

The Office Action of May 18, 2009 contains the rejections appealed by the

Applicant. Each of the rejections of claims 53-59, 61-63, 64, 65, and 66 is based on an “obvious to modify” rationale. MPEP 2143(G) states that after determining the *Graham* factual inquiries, office personnel must present “a finding that there was some teaching, suggestion, or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.” The T/S/M can be explicit or implied. Applicant contends the Office Action does not identify a T/S/M, implicitly or explicitly, in any of the prior art references that would arrive at the claimed invention.

The Office Action mentions a test for suggestion in prior art references on p. 11 and states: “In this case Brusasco suggests that a physical groove can be used to engage the balls, the resulting arrangement would be similar to USP 5,358,265 (Yaple).” Even if it is true that Brusasco can suggest to one of ordinary skill in the art to modify Brusasco to get Yaple, this is only one element of the claims where many other elements are not addressed as obvious! That is, there is no T/S/M discussed for any of the other elements of the non-obvious claims!

It is logical that there is no explicit or implicit T/S/M in the Office Action since no prima facie has been made for these claims, as proven above. If an explicit or implicit T/S/M had been identified, then issues would have been developed and Applicant would have been given fair opportunity to reply.

B. The Proposed Modification in Claim 53 Renders Hogan Unfit For Its Intended Purpose

Claim 53 discloses “said inner surface of said outer tubular body having a

grooved helical ball race formed on an inner surface thereof so as to be suitable for guiding said plurality of balls.” The primary prior art reference relied upon for the rejections in the Office Action is Hogan. When correctly interpreting Hogan and modifying Hogan to have the grooved helical ball race on the inner surface of the outer tubular body, Hogan becomes unfit for its intended purpose.

1. The Office Action Incorrectly Interprets Hogan

The Examiner incorrectly interprets the invention of Hogan to have helical ball races on the inner surface of the outer tubular body 34 that are formed by plastic distortion of the balls 38. Office Action, p. 5 (May 18, 2009). In Hogan, the balls 38 (all Figs.) are subjected to a radial load which presses the balls 38 against the inner wall of the outer tubular body 34. The helical ball races formed on the inner surface of Hogan’s outer tubular body 34 are not disclosed in Hogan because Hogan has a “smooth internal wall” of a uniform diameter. Hogan discloses:

The driven member 34 is formed with a smooth internal wall of a uniform diameter having closely fitted therein the two terminal washers 31 and 32, which act as sliding bearings for the sleeve to maintain it coaxially with the driving member 22.

Hogan, col. 2, ll. 34-39 (emphasis added). Hogan also discloses the balls 38 are in frictional engagement with the smooth inner wall of the driven member 34:

Each track 37 is filled with balls 38, extending less than half way into the track and projecting radially therefrom into frictional engagement with the smooth inner wall of the driven member 34.

Hogan, col. 2, ll. 53-56 (emphasis added).

Thus, when correctly interpreting Hogan, the inner surface of the outer tubular body 34 of Hogan is clearly disclosed to be smooth (i.e. no grooves) and in frictional engagement with the balls 38.

2. Modifying Hogan To Have Grooves on the Inner Surface Makes Hogan Unfit For Its Intended Purpose

If Hogan's inner surface of the outer tubular member 34 were modified to have grooved helical ball races formed on the inner surface of the outer tubular body 34, Hogan would be unfit for its intended purpose. The purpose of Hogan would not be met because modifying Hogan to have grooved helical ball races formed on the inner surface of the outer tubular body 34 would make Hogan unoperational. Remembering the balls 38 of Hogan are in frictional engagement with the smooth inner surface of the outer tubular body 34, Hogan describes the operation of the invention:

In the installation of the device, care must be exercised to always provide an axial clearance between the adjacent faces of the disks 28 so that the axial thrust exerted on the disks by the spring means 33 will always subject the balls 38 to a radial thrust against the inner wall of the driven member 34, the extent of which is adjustable by varying the compression of the spring means 33 through the nut 24. As rotation is imparted to the driving member 22 and consequently to the disks 28 and to the disks 29 and 30, the balls 28 rotating within their respective helical tracks 37 will, for each revolution of the driving member 22,

move axially an extent equal to the pitch of the helix of the tracks, which axial movement is transmitted to the driven member 34 by frictional engagement of the balls therewith.

Hogan, col. 2-3, ll. 64-75 (emphasis added).

The radial thrust of the balls 38 against the inner wall of Hogan's outer tubular member 34 is adjusted by varying the compression of the spring means 33 through the nut 24. The Hogan device depends on the smooth inner surface of the outer tubular member 34 to exert an inward radial force equal to the force of the outward radial force of the balls 38 so as to maintain frictional engagement of the balls 38 with the inner surface. If Hogan were modified to have grooves on the inner surface of the outer tubular body 34 formed by plastic distortion, then the balls 38 would only remain in frictional engagement if the radial thrust of the balls 38 was constantly maintained. If the radial thrust were to be lessened, the helical ball race of the nut assembly would retract radially inwardly, creating a volume larger than the balls, causing the balls to lose frictional engagement with the inner surface. Thus, forming grooves on the inner surface of Hogan's outer tubular body 34 would make Hogan unadjustable or else be unoperational. Hogan states:

Another object of the invention is to provide balls for transmitting motion from one driving to a driven member by frictional engagement with a smooth surface of the latter and to provide adjustable means for controlling the extent of said frictional engagement.

Hogan, col. 1, ll. 54-58.

Because Hogan requires frictional engagement of the balls 34 with the inner surface of the outer tubular body 34, and because the purpose of Hogan is to provide adjustable means for controlling the extent of the frictional engagement, Hogan would become unoperational if Hogan were modified to have helical ball races in the inner surface that are formed by plastic distortion of the balls 38. Since it would become unoperational, Hogan would be unfit for its intended purpose.

Thus, Hogan does not make claim 53 obvious because if modified to include the limitations of claim 53, Hogan would be unoperational and unfit for its intended purpose of adjustably maintaining frictional engagement of the balls 38 with the inner surface of the outer tubular body 34.

Thus, claim 53 is non-obvious and allowable.

Applicant believes independent claim 53 is not obvious under 103(a). Dependent claims 54-55 depend from independent claim 53. “If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious.” MPEP 2143.03 (citing *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)). Therefore, because independent claims 53 is not obvious under 35 U.S.C. 103(a), new dependent claims 54-66 are also not obvious.

C. The Principle Operation of Hogan Is Changed

The principle operation of Hogan, as is discussed in detail in Section (IV)(B) above, which is the frictional engagement of the balls 38 with the inner surface of the outer tubular body 34 would be changed if Hogan were modified to have helical ball races formed by plastic deformation in the inner surface of the outer tubular body 34.

The plastic deformation of the inner surface would make a volume larger than the ball if the adjusting means were loosened from a tightened position. Thus, Hogan would not operate by frictional engagement, and would be unoperational because a different principle of operation would be required.

D. Hogan Teaches Away From Grooved Helical Ball Races On The Inner Surface of the Outer Tubular Body

“When the prior art teaches away from combining certain known elements, discovery of successful means of combining them is more likely to be nonobvious.” *KSR v. Teleflex*, 82 USPQ2d at 1395. Hogan teaches away from forming helical ball races on the inner surface of the outer tubular body because Hogan specifies that movement is transmitted to the driven member only by frictional engagement of the balls with that driven member (as is discussed in Sections (IV)(B) and (IV)(C) above). Moreover, the ball friction drive of the Hogan patent utilizes a means to adjust the thrust against the inner wall. If the drive of the Hogan patent utilizes such an adjusting means, it is precisely to permit a transmission of the movement through friction engagement only and absolutely not for deforming the wall of the outer tubular body. These adjusting means are utilized so as to avoid such a wall deformation.

Further, Hogan teaches that there is no "plastic deformation" of the inner wall of the outer tubular body. In particular:

In practice, material hardness of the operative elements is to be as great as conveniently possible with the usual heat treating practices, thereby

limiting the rolling friction of the balls within their tracks to a minimum, which friction, of course, must be overcome by sufficient driving power of the power source. The sliding friction resulting from the radial thrust of the balls against the driven member is, of course, greater than the rolling friction, thereby enabling traction without slippage of the balls with the driven member to transmit linear motion thereto.

Hogan, col. 4, ll. 10 - 19. It can be seen that the operative elements of the drive system of the Hogan patent are formed of a very hard material in order to permit sliding friction and to limit the rolling friction of the balls. In this way, the movement of the driven member is generated by tracking this driven member without slippage of the balls. Additionally, the very hard material used for the operative elements of this drive specifically strongly excludes any plastic deformation that could be caused by the pressing of the balls.

As such, Hogan teaches away from modifying the inner surface of the outer tubular body to have grooved helical ball races, and the analysis of the Examiner that the grooved inner surface of the outer tubular body being caused by this plastic deformation is completely contrary to the teachings of the Hogan patent.

E. Claims 53-66 Are Patentably Distinguishable Over Prior Art

Applicant respectfully contends that the formation of the grooved helical ball races in the inner surface of the outer tubular body is clearly patentably distinguishable from the prior art combination.

First, Hogan states in column 1, lines 20 - 35:

In ball screw and nut mechanisms as well as in the conventional screw and nut constructions, the rate of axial travel of one of the members for a given rotary speed of the other is primarily governed by the pitch of the helical ball channels or screw threads respectively. In the case of ball screw and nut, the pitch of the helical ball channel is limited by the size of the balls, and in the conventional screw and nut construction the pitch of the thread is limited by the size of the screw threads required to carry the intended load. Thus, when axial motion of one of the members is required at a rate lower than that obtainable by the smallest possible pitch of either the ball channel or screw threads, the mechanism must be provided with a speed reducing means such as a gear train or the like, which increases the cost of manufacture as well as the size and weight of the unit.

Second, the objective of the Hogan patent is quite different than that of the present invention, as recited in Hogans' column 1, lines 36 - 40:

It is therefore the main object of this invention to provide a device through which relatively high speed rotary motion of one driving member can be directly translated into extremely low speed linear motion of a driven member.

This objective is achieved in the Hogan patent with a ball friction drive having a ball screw and a nut device. The ball screw comprises a plurality of juxtaposed disks 28 and two end disks 29 and 30. Both external peripheral edges of the disks 28 as well

as the opposed external peripheral edges of the end disks 29 and 30 are beveled at a given angle. Each disk 28, as well as the opposed faces of the end disks 29 and 30, are shaped so that the peripheral inclined opposed edges 36 of each adjacent disk defines together a V-shaped helical groove 37 filled with balls 38 extending from this groove to cooperate with the driven member 34. Such a helical groove presents two ends constructed by a passageway 39. In this construction, when making one turn, a disk 28 moves axially for a very small distance that corresponds to the pitch of the screw. This is also very small and much smaller than the size of the balls 38 located in the helical group 37. As such, in the drive system of the Hogan patent, the pitch of the screw is defined by the two juxtaposed disks 28 or by one disk 28 and an end disk 29 or 30. It is not defined by two successive helical grooves 37 of the screw.

Contrary to the Examiner's arguments, if one with ordinary skill in the art modified the drive system of the Hogan patent to provide the inner wall of the driven member with a continuous helical ball race (such as that described in Brusasco) for one helical groove of the screw in the Hogan patent, this ball race should adopt the very small pitch, as mentioned before. Since the drive system of the Hogan patent has a plurality of disks 28 and end disks 29 and 30 that define the plurality of ball races on the screw, any modification of the drive system of the Hogan patent, as suggested by the Examiner, would lead one to provide the inner wall of the driven member with as many ball races as the screw has. This would lead to a superposition of a plurality of ball races in which each has a very small pitch. This cannot be achieved, in any way, since there is not enough room on the inner wall of the driven member to

provide this inner wall with such ball races.

Third, and as mentioned herein above, the movement of the driven member in Hogan is generated by the tracking of this driven member because of the frictional interaction between the balls 38 and the driven member 34. In order to achieve such a frictional interaction, it is necessary to bring the balls 38 into frictional contact with the driven member 34. This can be achieved only by tightening the nut 24 so as to bring the disks 28, 29 and 30 closer together. When the disks are brought closer together, the nominal diameter of the ball races is increased so as to urge the balls radially against the inner wall of the driven member. The bringing of these disks together has another collateral effect causing the approaching of the balls of the successive ball races of the screw to change pitch. Such a changing of the pitch would imply that the balls of the ball race of the screw would not be able to cooperate with the ball race on the inner wall of the driven member that corresponds to the ball race of the screw when no changing of the pitch occurs.

One must conclude that one having ordinary skill in the art would conclude that the very small pitch of the drive system of the Hogan patent would be completely incompatible with a plurality of ball races formed on the inner wall of the driven member because it would impossible to achieve the objectives of the present invention. As such, the Hogan patent actually teaches against the construction of the present invention as defined in independent claim 53.

Alternatively, even if one could imagine that a person with ordinary skill in the art would provide the inner wall of the driven member with continuous helical ball

races that correspond to each ball race of the screw, this solution would go against the purpose of the teachings of the Hogan patent. One having ordinary skill in the art would encounter another problem. The balls of the different ball races of the screw would not cooperate with the same ball race of the inner wall of the driven member without having to adapt the distances between the ball races and the screw. As a result, Applicant respectfully contends that the Hogan patent and the Brusasco patent cannot be combined. This would create complete incompatibility between the essential features of the Hogan patent and the Brusasco patent. Fundamentally, one would never modify the Hogan patent so as to incorporate the grooves on the inner wall of the outer tubular member of the Brusasco patent because complete incompatibility would occur. On this basis, Applicant respectfully contends that the present invention is non-obvious in view of the teachings of this prior art combination. Brusasco describes, in particular, a plurality of nuts that are provided each with a helical rolling groove having a different pitch, a screw having a shaft and a spring, and a plurality of balls cooperating with the rolling grooves of the spring and of the nuts. The spring is in the form of a spiral that is shaped to have concave coils defining a rolling groove in which the shaft is axially engaged. It must be observed that the shaft is freely engaged into the spiral spring. The spiral spring is able to adapt itself to the different pitch of the rolling grooves of the nut by expanding or retracting. This type of adaptation will lead to a modification of the pitch of the rolling groove of the spring. As such, the devices disclosed in the Hogan patent and the Brusasco patent differ strongly from the present invention, as defined by

independent Claim 53. Since the prior art combination teaches against each other and does not describe the structure of the present invention, Applicant respectfully contends that the present invention is non-obvious with respect to this prior art combination. As such, independent claim 53 is patentably distinguishable from the prior art, and it follows the dependent claims 54-66 are also distinguishable over prior art.

V. Conclusion

Appellant appeals the decision that grooved helical ball races formed on the inner surface of the outer tubular body by plastic deformation is obvious. Appellant respectfully contends that the structural limitations of claims 53-66 are patentable, and that the articulated reasoning given for obviousness lacks appropriate rational and does not support a prima facie case for obviousness.

In the alternative, Applicant contends claims 53-66 are patentable because there is no T/S/M to modify the prior art references to arrive at the invention of claims 53-59, 61-63 and 64-66; the proposed modification in claim 53 renders Hogan unfit for its intended purpose; the principle operation of Hogan is changed; Hogan teaches away from grooved helical ball races on the inner surface of the outer tubular body; and claims 53-66 are patently distinguishable over prior art. The proposed modification in claim 53 renders Hogan unfit for its intended purpose because the Office Action incorrectly interprets Hogan, and modifying Hogan to have grooves on the inner surface makes Hogan unfit for its intended purpose.

Based upon the foregoing analysis, Appellant contends that independent claim

53 of the present invention is patentably distinguishable from the prior art. Moreover, the remaining dependent claims 54-66 are also allowable because they depend upon allowable independent claims.

The foregoing Brief is intended to assist the Board of Appeals in examining the application and, in the course of explanation, may employ shortened or more specific or variant descriptions of some of the claim language. Such descriptions are not intended to limit the scope of the claims; the actual claim language should be considered in each case. Furthermore, the remarks are not considered to be exhaustive of the facets of the invention which render it patentable, being only examples of certain advantageous features and differences which Appellants' attorney chooses to mention at this time.

Reconsideration of the application, as amended, and allowance of claims 53-66 are respectfully requested. The required fee for transmittal of the Appeal Brief is enclosed herewith.

Respectfully submitted,

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Date

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CLAIMS APPENDIX

1-52. (Cancelled)

53. (Rejected) An actuator comprising:

an outer tubular body;

an inner tubular body having a portion positioned inside said outer tubular body;

a nut assembly interconnected to said inner tubular body, said nut assembly having at least one helical ball race, the helical ball race having a helical portion extending circumferentially for less than 360° around said nut assembly, said helical ball race having a widened portion connecting to a first end and to a second end of said helical portion, said nut assembly comprising a plurality of aligned elements, each of said plurality of aligned elements having a generally cylindrical shape with at least one bevel forming a helical cam surface, the helical cam surfaces of adjacent aligned elements of said plurality of aligned elements defining the helical ball race;

a plurality of balls received between the helical ball race and an inner surface of said outer tubular body, said widened portion defining a re-circulation zone for said plurality of balls; and

a driving means cooperative with said nut assembly for rotating said nut assembly so as to translate said outer tubular body relative to said inner tubular body, said inner surface of said outer tubular body having a grooved helical ball race formed on an inner surface thereof so as to be suitable for guiding said plurality of

balls, said driving means comprising a motor mounted in a fixed position inside said inner tubular body.

54. (Rejected) The actuator assembly of Claim 53, said inner surface of said outer tubular body having a helical pitch substantially equal to a helical pitch of the helical ball race of said nut assembly.

55. (Rejected) The actuator assembly of Claim 53, said at least one helical ball race comprising a plurality of ball races, the recirculation zones of said plurality of ball races being not aligned with a direction of the displacement of said outer tubular body.

56. (Rejected) The actuator assembly of Claim 55, said plurality of ball races being evenly angularly disposed about the direction of displacement.

57. (Rejected) The actuator assembly of Claim 53, each of the helical cam surfaces defining a setback, a pair of said plurality of aligned elements being positioned with respect to each other such that the setbacks thereof face each other, the setbacks defining the recirculation zone.

58. (Rejected) The actuator assembly of Claim 53, said plurality of aligned elements being tightenable with respect to each other.

59. (Rejected) The actuator assembly of Claim 58, further comprising:
a nut member cooperative with said plurality of aligned elements so as to adjust the tightening of said plurality of aligned elements.

60. (Rejected) The actuator assembly of Claim 59, further comprising:
a spring interposed between said nut member and said plurality of

aligned elements.

61. (Rejected) The actuator assembly of Claim 53, each of said plurality of aligned elements having a cross-section with a beveled circular edge, the helical cam surface being inclined relative to an axis of said cylindrical shape, the helical cam surface having ends connected to a setback surface of a generally conical shape.

62. (Rejected) The actuator assembly of Claim 61, the recirculation zone being defined by the setback of a pair of said plurality of aligned elements.

63. (Rejected) The actuator assembly of Claim 53, said helical ball faces of said inner surface of said outer tubular body being formed by plastic distortion by said plurality of balls.

64. (Rejected) The actuator assembly of Claim 53, said helical surface of said outer tubular body comprising:

an interior tube molded within said outer tubular body, said interior tube having said helical ball race formed therein.

65. (Rejected) The actuator assembly of Claim 53, further comprising:

another tubular body cooperative with said outer tubular body, said outer tubular body connected to another nut assembly such that a rotation of said another nut assembly causes a displacement of said another tubular body with respect to said outer tubular body.

66. (Rejected) The actuator assembly of Claim 53, said outer tubular body being formed of a material selected from the group consisting of aluminum, carbon fibers and molded polymers.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.